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Does a real science need exist?
Do we need something like ZeroNet?
Is there a scientific need for more modeling?

Water rights and water issues are local issues. The water basin modeling that is proposed supposes that it's possible to move beyond the local politics. Is that really possible?



Frequently Asked Questions

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Scientists agree that the USA has moved into a drought period, and that this drought may last several decades. The basic data or algorithms to predict the impacts of long-term drought on water supplies do not exist or are inadequate. Historical data from other semi-arid regions suggest that drought, coupled with poor land and water management decisions, can result in irreparable changes to the hydrologic system, including desertification. Water yields and water quality may permanently change. ZeroNet's monitoring test-beds and predictive science will focus on determining the critical changes that may occur to the hydrologic water balance in the semi-arid Southwest and test management scenarios to minimize negative changes. This modeling, which can assist stakeholders with making wise future decisions regarding the use of natural resources, can ultimately prevent negative economic impacts, energy shortages, and other negative impacts associated with drought conditions.

Water rights are often perceived as local issues. While there is and always will be a local element in water rights, the fact is that water rights and water supply issues are far greater than the local context. Huge interstate water disputes have existed in the Southwest for many years. Major examples are the California/Nevada/Arizona conflicts that took place in the early to mid 1900's and the Texas/New Mexico compact that grew out of major lawsuits over water supply. With watersheds fully allocated and reservoir supplies at historical lows, pressure on fresh water today is at unprecedented high levels throughout the entire western United States. The multi-year drought, now in its sixth year, extends throughout the desert Southwest, Rocky Mountain region and into the Northwest, far beyond local boundaries. It is currently impacting agriculture production, power generation, and recreational opportunities in all of the affected regions. Irrigation seasons are being shortened, municipal water use restrictions implemented and hydroelectric generation is expected to be lower due to the shortage of water. These effects are occurring today.

Solutions to the water issues facing much of the country will, of necessity, begin at a local level. Their impacts, however,

extend well outside the immediate region. As an example, the San Juan River ultimately flows into Lake Powell, which is part of the Colorado River system that supplies water to Arizona, California, and Nevada.

The type of modeling that is being proposed as part of ZeroNet has previously been used to develop cooperative solutions in water-short areas. The information it will provide empowers stakeholders, including municipal, agricultural, industrial, and other users, to fully understand the impacts that their water use decisions have, not only for them, but also to the larger community and region. This greater understanding is a fundamental key to developing mutually beneficial solutions that extend beyond political barriers. These solutions and approaches also serve as templates for addressing similar challenges outside the immediate geographical area.

ZeroNet will deploy, test and evaluate existing state-of-the-art technology in parallel with developing and testing the next generation of technology. ZeroNet aims to define “best industry practice” for reducing freshwater use in power generation today, while developing best industry practices for future power systems.

The technology and applications being developed by ZeroNet are not commercially employed today. For example, no power generator has previously used produced water for cooling before. This is a groundbreaking experiment for the power industry. ZeroNet will perform the economic analyses and operational tests required to determine if new technology and processes are viable for widespread deployment through the power sector.

In addition, ZeroNet will develop and test advanced cooling systems that have the potential for reducing water use in both older power plants, where 100% dry cooling adaptation is extremely difficult and costly, and newer power plants located in semi-arid regions where dry cooling systems are inefficient.

Wet Surface Air Cooling (WSAC) *pilot testing*: Test WSAC at San Juan Generating Station with produced water. This test will provide important feasibility, economic, and technical information about the use of produced water with WSAC and the use of produced water in general.

Advanced Treatment Options Identification & Test Plan: Identify 2 to 3 advanced treatment technologies that provide one or more of the following benefits over current technology:

- Lower treatment costs—reduce treatment costs over current methods
- Ability to treat degraded waters—produced water or other high-saline water may permit use of additional water sources that are not treatable using current technology
- Enhanced recovery rates—provide more useable water per treated gallon

Is the proposed technology cutting edge?

What are some specific deliverables for FY04 & FY05?

We need water savings, not just a neat study. Will ZeroNet technology outcomes and applications save water?
Will ZeroNet introduce new technology that lowers the cost of saving water?

Test plan for 2005: Develop a test plan for implementation in 2005 for new treatment technologies identified in 2004.

Decision support water modeling tool: This tool will permit end users to understand and assess the effects of their own water use decisions on themselves and the larger community. Ultimately, this should lead to decisions that optimize water use for the entire community/region.

Produced Water Assessment: PNM is continuing the assessment of the produced water initiative that was started under ZeroNet. Using additional data that will be taken from the WSAC demonstration and combining it with previously (2003) gathered data in conjunction with ZeroNet, the economics and operating issues of using produced water for power plant cooling will be identified, analyzed, and completed.

Advanced monitoring and measurement technologies: Cutting-edge, on-site and remote water measurement and monitoring technology will be deployed at test-beds in the San Juan basin to quantify a basin water budget. The water budget will be used to identify where the most effective water savings practices can be implemented in the power industry and other water use sectors.

All of the ZeroNet outcomes and applications are aimed at the goals of either reducing current water use or increasing the useable water supply through new applications of technology. Produced water, for example, represents a new source of water that could replace some of the demand on the existing freshwater sources. It has the potential to provide up to 10%–15% of water needs at San Juan Generating Station, approximately 2,000–3,000 acre feet annually, with a higher potential depending on results of treatment technologies and final feasibility studies. Additional water may also be available through advanced treatment technologies that provide higher recovery rates than conventional methods, thereby increasing the yield of treated and useable water and, potentially, decreasing treatment costs. In addition, new treatment methods being examined for testing may also permit the treatment of waters that are too dirty for current treatment technologies, again effectively increasing the useable water supply.

The proposed monitoring and modeling initiatives contribute to water savings by identifying waste of the water resource across water-use sectors and by providing the tools necessary to optimize water use. By identifying wasteful points/practices in the overall water system, these areas or practices can be improved upon, thus increasing the overall water supply for all parties. An improved supply will ultimately result in decreased costs and a higher level of economic activity.

Finally, education and outreach through the ZeroNet program will increase awareness and understanding of the impacts that water use has on the community at large. ZeroNet outcomes will help facilitate

Who should fund this research?
Is ZeroNet some kind of corporate
subsidy?

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cooperative agreements and policies that benefit the greater good of the community and region at large.

Drought and resulting water supply problems extend throughout the western United States and are predicted to worsen. Prolonged shortages have direct effects on regional and national economies, threaten national security by reducing available energy (electricity) supplies, and have potentially serious socio-economic effects. Impacts of drought and reduced water supply extend across local and state boundaries. While private industry will be forced to incur significant costs to move itself into a new water use paradigm, the involvement and support of federal and state governments is critical to seeding and sustaining the efforts required to move forward.

The Department of Energy (DOE) owns the nation's energy security mission and is the leader in science and technology aimed at ensuring a safe, reliable, and affordable supply of energy now and for future generations. This mission is currently threatened by a dwindling water supply. DOE currently sponsors R&D related to sustainable energy production, including carbon sequestration, FutureGen, and hydrogen fuel cells. However, thermoelectric power generation is currently, and will remain for the foreseeable future, the dominant technology for electricity production in the United States. To sustain coal and gas based thermoelectric generation, and to ensure sustainable water supplies for future power systems, DOE must participate in solving science and technology problems related to a dwindling freshwater cooling supply.

In ZeroNet's case, the private/industry sector is represented by PNM resources. To date, PNM, working with LANL and EPRI, has incurred out of pocket expenditures exceeding several hundred thousand dollars for initial analysis and research. The solutions actively being contemplated and investigated by PNM anticipate costs reaching into the tens of millions of dollars. Furthermore, the technology developments and applications being examined are widely applicable to the energy specific and broader industry. However, to be successful, these kinds of efforts require the overreaching support and authority of government involvement. Continued federal participation is a key foundation for developing successful solutions to the water shortage problems facing the country today.

The ZeroNet cooperative partnership is an excellent model to develop solutions to national and global level problems, such as water shortages, by combining the need-driven innovation of industry, the research capability of national laboratories, and the backing of the federal government. The synergies created will bring about effective and innovative solutions to the difficult challenges facing the country with regards to water resources.